Master Physique fondamentale et applications
Superconductors for fusion

Informations

Composante : Faculté des Sciences

Langue(s) d'enseignement

Anglais

Contenu

This lecture gives an overview of the physics and engineering issues in magnetic confinement fusion. Not all subjects are fully treated in detail, the aim is to show the ensemble of interconnected topics.

Modalités d'organisation

1) Introduction to superconductivity: superconductivity, the strange magnetic properties of type II superconductors, critical field and critical temperature, applications: the era of NbTi, superconducting strands, critical current densities, load line, current sharing temperature, temperature margin, superconducting materials in ITER, losses
2) Fusion and Superconductivity: from JET to Tore Supra and ITER, “Large Coil Task”, Tore Supra, EAST, KSTAR, W7-X, JT-60SA, introducing DEMO
3) Quench protection and detection: hot spot criterion, quench protection circuit, quench Detection
4) Dimensionning of superconducting magnets for fusion: rôle of plasma magnetic field in fusion reactor performance, radial extension of the toroidal field system, central solenoid
5) Cable in conduit conductors (CICC): CICC to face fast energy deposition specific for fusion magnets, forced flow helium to remove cryogenic losses, temperature difference between annular channel and central hole, performance of CICC, joints between CICC, economical aspects
6) ITER magnet system: why superconducting magnets ; toroidal field, central solenoid, poloidal field systems ; model coils ; thermal load; economical aspects

VOLUME HORAIRE

- Volume total: 40 heures
- Cours magistraux: 20 heures
- Travaux dirigés: 20 heures

Codes Apogée

- SPFCU21C [ELP]

Pour plus d'informations

Aller sur le site de l'offre de formation...

Dernière modification le 18/06/2024